

What Works Clearinghouse



Middle School Math

March 26, 2007

UCSMP Algebra

Program description *University of Chicago School Mathematics Project (UCSMP) Algebra*, designed to increase students' skills in algebra, is appropriate for students in grades 7–10, depending on the students' incoming knowledge. This one-year course highlights applications, uses statistics and geometry to develop the

algebra of linear equations and inequalities, and includes probability concepts in conjunction with algebraic fractions. The curriculum emphasizes graphing, while manipulation with rational algebraic expressions is delayed until later courses. This curriculum uses the UCSMP textbook.

Research One study of *UCSMP Algebra* first edition, comparing it with *Saxon Math*, and one study of *UCSMP Algebra* second edition, comparing it to traditional curricula, met the What Works Clearinghouse (WWC) evidence standards with reservations.

The two studies included more than 200 middle- and high-school students in four rural, suburban, and urban districts in the West, Midwest, Northeast, and South.¹

Effectiveness *UCSMP Algebra* was found to have potentially positive effects on math achievement.

**Rating of effectiveness
Improvement index²**

Math achievement

Potentially positive effects

Average: +13 percentile points

Range: –5 to +31 percentile points

1. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.
2. These numbers show the average and range of the improvement index for all findings across the studies.

Additional program information

Developer and contact

Developed by the University of Chicago School Mathematics Project (UCSMP). Address: 6030 S. Ellis Avenue, Chicago, IL 60637. Web: <http://social-sciences.uchicago.edu/ucsmp/Secondary.html>. Telephone: (773) 702-1130. *UCSMP Algebra* 2nd edition is distributed by Pearson, Prentice Hall. Web: <http://www.phschool.com/atschool/ucsmp/index.html>. Email: Communications@pearsoned.com. Telephone: (800) 848-9500. The third edition will be available from the Wright Group/McGraw-Hill.

Scope of use

UCSMP Algebra first edition was developed and tested between 1985–88; the second edition was developed and tested between 1992–94.³ The third edition has been in development since 2004. According to the developers at the University of Chicago, since 1983, 3.5–4 million students in elementary, middle, and high schools have been using UCSMP materials and various curricula. Scope of use and demographic characteristics of the students using the *UCSMP Algebra* curriculum are not available.

Research

Three studies reviewed by the WWC investigated the effects of *UCSMP Algebra* first and second editions. One study (Peters, 1992) was a randomized controlled trial with randomization problems that met WWC evidence standards with reservations.⁴ A second study (Thompson, Senk, Witonsky, Usiskin, & Kaeley, 2006) used a quasi-experimental design that met WWC evidence standards with reservations. The remaining study did not meet WWC evidence screens.

Peters (1992) included 36 “math talented” students from one junior high school in Nebraska. Most of the students were Caucasian, and the district was a unique rural and suburban mix

Teaching

A typical lesson consists of commentary and explanations about the math concepts or skills, followed by applications of the concepts or skills taught in a variety of problem sets. The textbook includes summary and vocabulary sections to promote student awareness of the skills, properties, uses, and representations of the math ideas introduced in the chapter. The summary section provides an overview of the key concepts and skills and lists the relevant terms explored in the chapter. Refresher sections offer a set of problems that may be used by the teacher for students who are weak in a particular area. The textbook also contains progress self-tests for students.

Cost

A student text book costs \$56.97. A teacher resource book titled *Implementing UCSMP: A User's Handbook* costs \$12.97. An additional Study Skills Handbook costs \$30.97.

that borders two large cities. Students in the intervention group used the *UCSMP Algebra* first edition textbook, while students in the comparison group used the *Saxon Middle School Math* curriculum.

Thompson et al. (2006) included 189 students from three high schools in the West, Northeast, and South.⁵ The sample consisted of a diverse student population, including students from ethnic minorities and low socioeconomic status. The intervention group used the *UCSMP Algebra* 2nd edition textbook, while students in the comparison group used other non-UCSMP textbooks that were used by the schools prior to the study.

3. The second edition includes new emphases on student writing and projects and increased use of technology, particularly using graphing calculators. Because the difference between the two editions is not substantive, the WWC reviewed research on both editions in this intervention report.
4. Peters (1992) compared *UCSMP Algebra* with *Saxon Middle School Math*. The author indicates that a random selection of numbers was used to divide the 36 participants between the intervention and comparison groups. But due to scheduling problems with other course offerings, the number of students in each group was changed to 17 in the *UCSMP Algebra* group and 19 in the *Saxon Middle School Math* group. Therefore, the study meets standards with reservations, according to WWC criteria.
5. Most of the students were from ninth grade, but about 15% of the sample was enrolled in grades 10–12.

Effectiveness Findings

The WWC review of middle school math curricula addresses student outcomes in the math achievement domain.

Peters (1992) reported no statistically significant differences between the *UCSMP Algebra* group and the *Saxon Middle School Math* group.⁶ The study also examined students' understanding of algebraic components as measured by scores on four unit tests and reported that *UCSMP Algebra* had an overall higher mean score than the comparison group (no level of statistical significance was reported). Further, the effect size was neither statistically significant nor large enough to be considered substantively important by WWC criteria (at least 0.25).⁷

Thompson et al. (2006) examined students' math achievement using three outcomes—the High School Subject Tests: Algebra, a test of algebra readiness, and a problem-solving and understanding test⁸—and reported a statistically significant difference favoring *UCSMP Algebra* students over comparison students on algebra readiness and problem-solving and understanding.

The level of statistical significance of those differences was confirmed by the WWC. Further, the average effect size across all three outcomes in this study was statistically significant, according to the WWC analysis.

In sum, one study of *UCSMP Algebra* 1st edition showed an indeterminate effect, and one study of *UCSMP Algebra* 2nd edition showed a statistically significant positive effect.

Rating of effectiveness

The WWC rates the effects of an intervention in a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative. The rating of effectiveness takes into account four factors: the quality of the research design, the statistical significance of the findings,⁹ the size of the difference between participants in the intervention and comparison conditions, and the consistency in findings across studies (see the [WWC Intervention Rating Scheme](#)).

The WWC found *UCSMP Algebra* to have potentially positive effects on math achievement

Improvement index

The WWC computes an improvement index for each individual finding. In addition, within each outcome domain, the WWC computes an average improvement index for each study and an average improvement index across studies (see [Technical Details of WWC-Conducted Computations](#)). The improvement index represents the difference between the percentile rank of the average student in the intervention condition versus the percentile rank of the average student in the comparison condition. Unlike the rating of effectiveness, the improvement index is entirely based on the size of the effect, regardless of

the statistical significance of the effect, the study design, or the analyses. The improvement index can take on values between –50 and +50, with positive numbers denoting results favorable to the intervention group.

The average improvement index for the math achievement domain is +13 percentile points across the two studies, with a range of –5 to +31 percentile points across findings.

Summary

The WWC reviewed three studies on *UCSMP Algebra*. Of these, two studies met WWC evidence standards with reservations and

6. Peters (1992) reported statistically significant growth between pretest and posttest among both *UCSMP Algebra* and *Saxon Math* students.

7. The Orleans-Hanna prognosis test is typically administered as a measure of students' basic Algebra skills and does not cover the full scope of the knowledge and skills taught in a *UCSMP Algebra* course. It was accepted for review because it assesses important mathematics knowledge and skills relevant to middle school math.

8. The algebra readiness and problem-solving and understanding tests were constructed by UCSMP.

9. The level of statistical significance was reported by the study authors or, where necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation, see the [WWC Tutorial on Mismatch](#). See [Technical Details of WWC-Conducted Computations](#) for the formulas the WWC used to calculate the statistical significance. In the case of *UCSMP Algebra*, corrections for clustering and multiple comparisons were needed.

The WWC found *UCSMP Algebra* to have potentially positive effects on math achievement *(continued)*

one study did not meet WWC evidence screens. Based on the results of these two studies, the WWC found potentially positive effects on students' math achievement. The evidence presented in this report may change as new research emerges.

References

Met WWC evidence standards with reservations

Peters, K. G. (1992). Skill performance comparability of two algebra programs on an eighth-grade population. *Dissertation Abstracts International*, 54(01), 77A. (UMI No. 9314428)

Thompson, D. R., Senk, S. L., Witonsky, D., Usiskin, Z., & Kaeley, G. (2006). *An evaluation of the second edition of UCSMP Algebra*. Chicago: University of Chicago School Mathematics Project.

Did not meet WWC evidence screens

Mathison, S., Hedges, L. V., Stodolsky, S., Flores, P., & Sarther, C. (1989). *Teaching and learning algebra: An evaluation of UCSMP ALGEBRA* (Evaluation Rep. No. 88/89-ALG-1). Chicago: University of Chicago.¹⁰

For more information about specific studies and WWC calculations, please see the [WWC UCSMP Algebra Technical Appendices](#).

¹⁰. Complete data are not reported: the WWC could not compute effect sizes.